

1/28

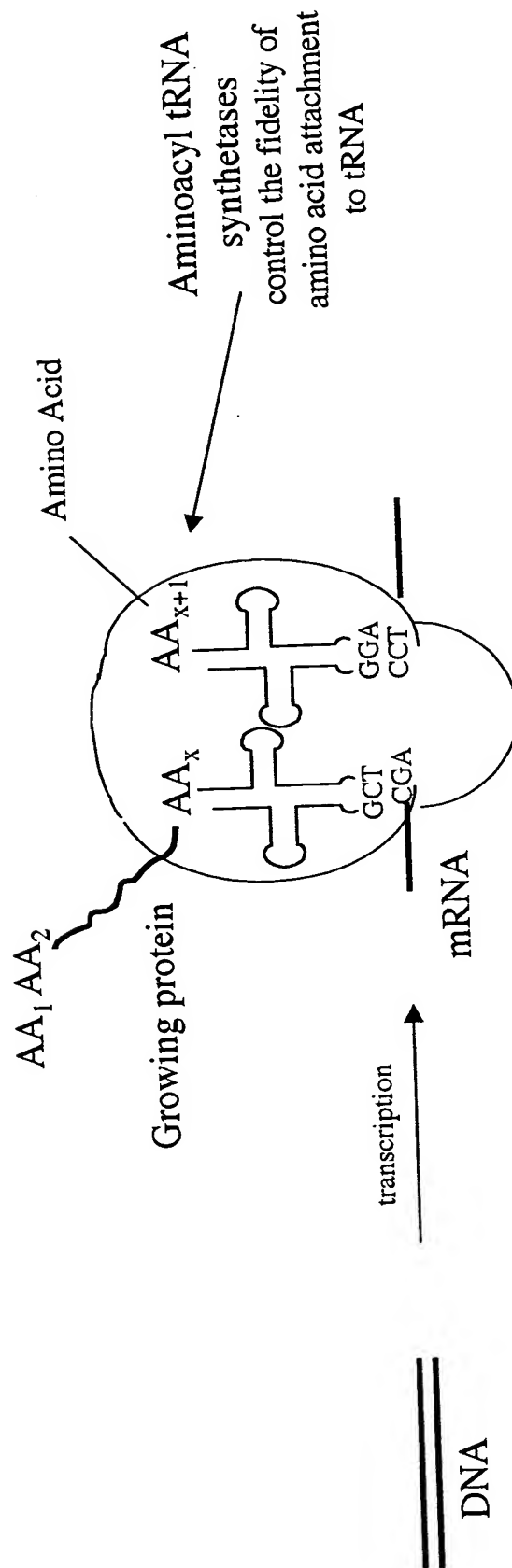
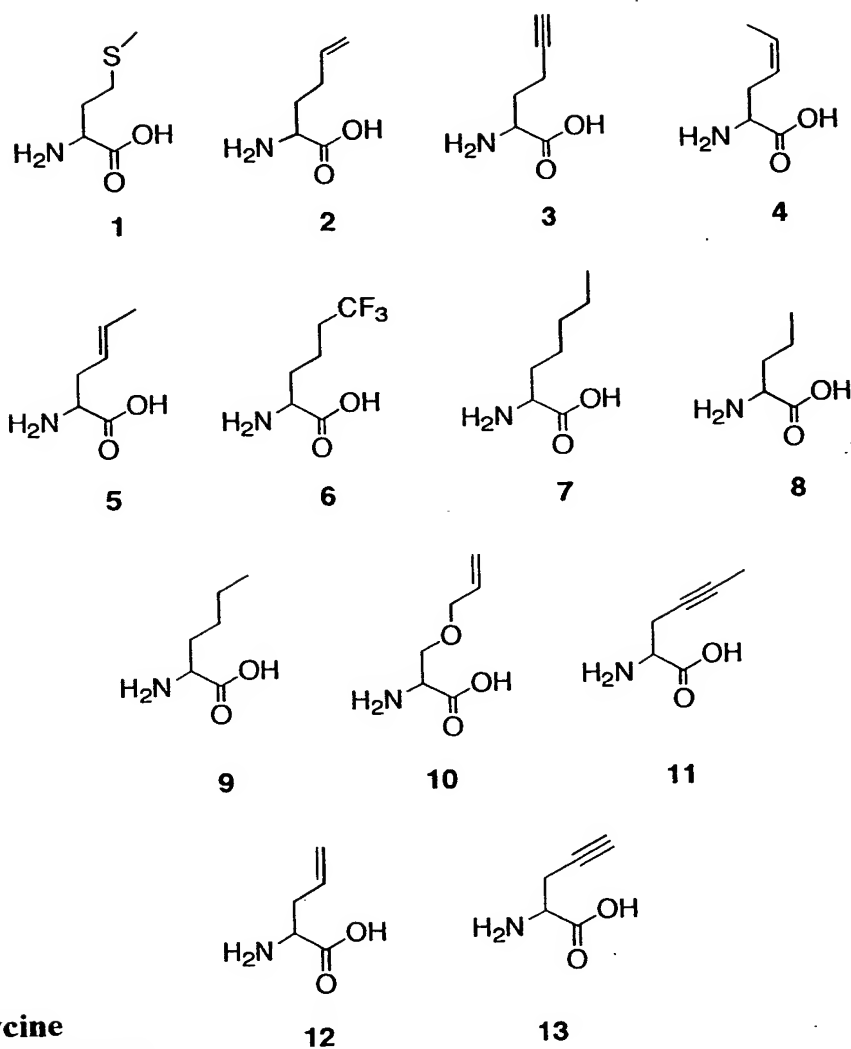


FIG. 1

2/28



1. Methionine
2. Homoallylglycine
3. Homopropargylglycine
4. Cis-crotylglycine
5. Trans-crotylglycine
6. 6,6,6-trifluoro-2-amino hexanoic acid
7. 2-amino heptanoic acid
8. Norvaline
9. Norleucine
10. o-allylserine
11. 2-butynylglycine
12. Allylglycine
13. Propargylglycine

FIG. 2

3/28

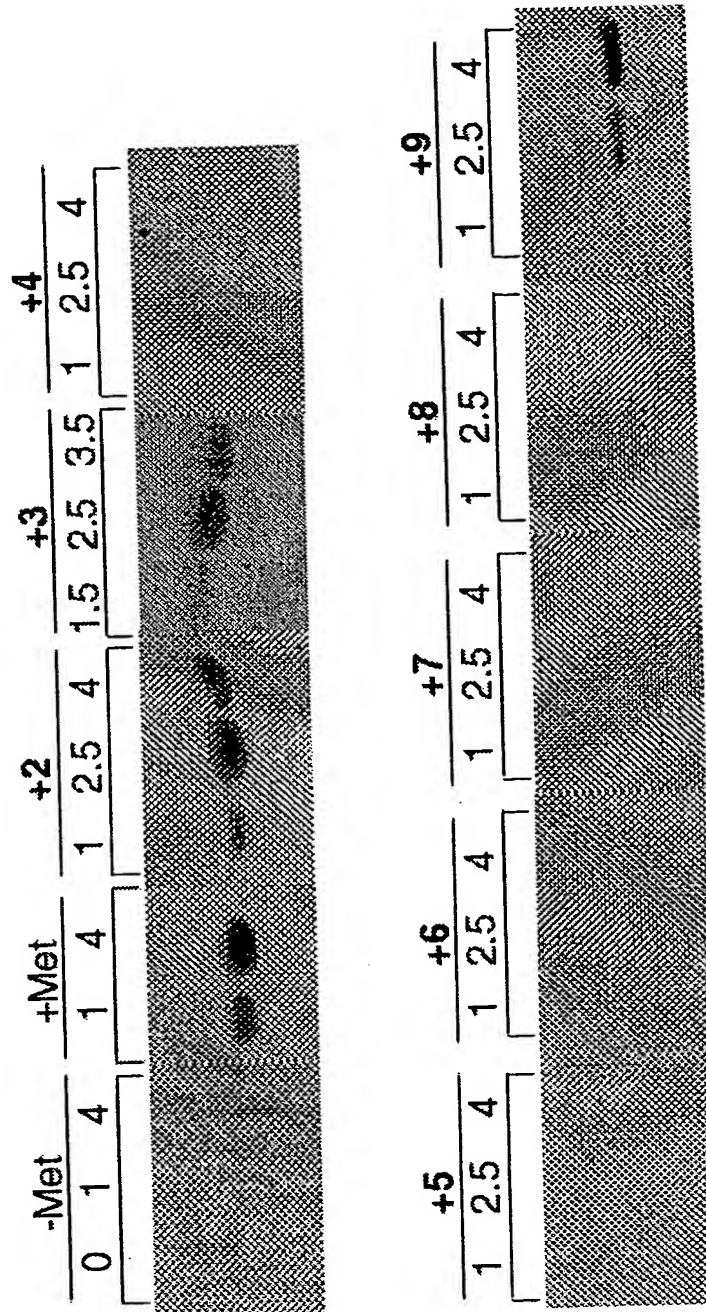


FIG. 3

4/28

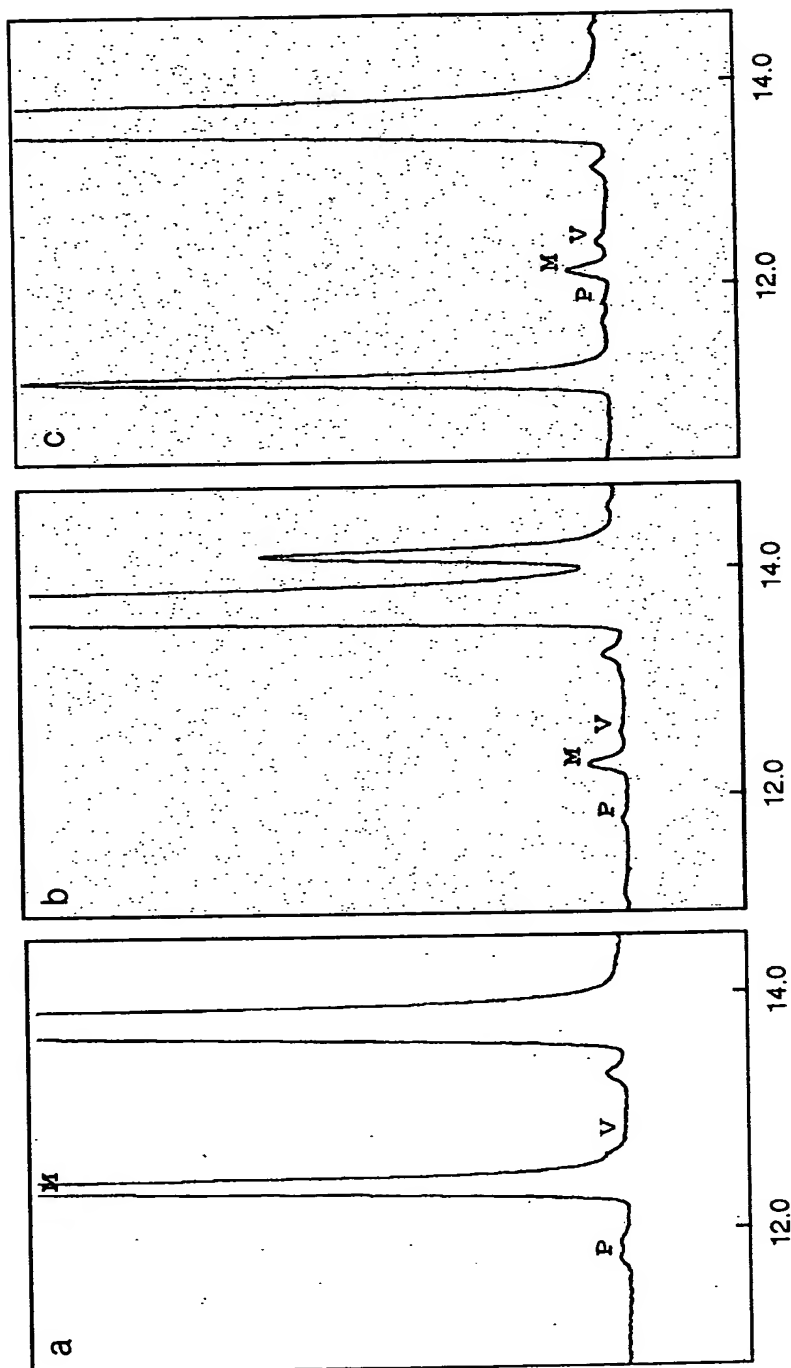


FIG. 4

5/28

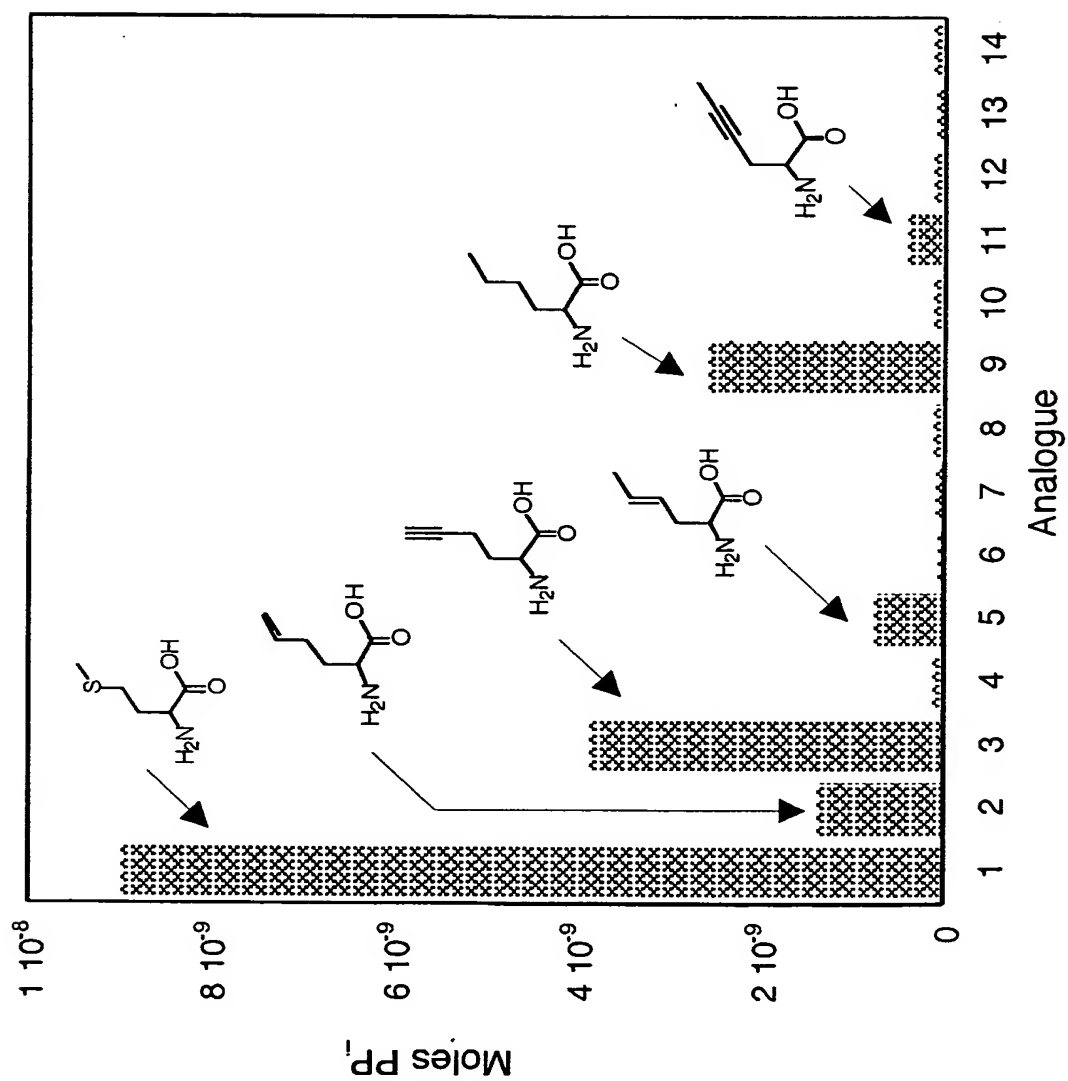


FIG. 5

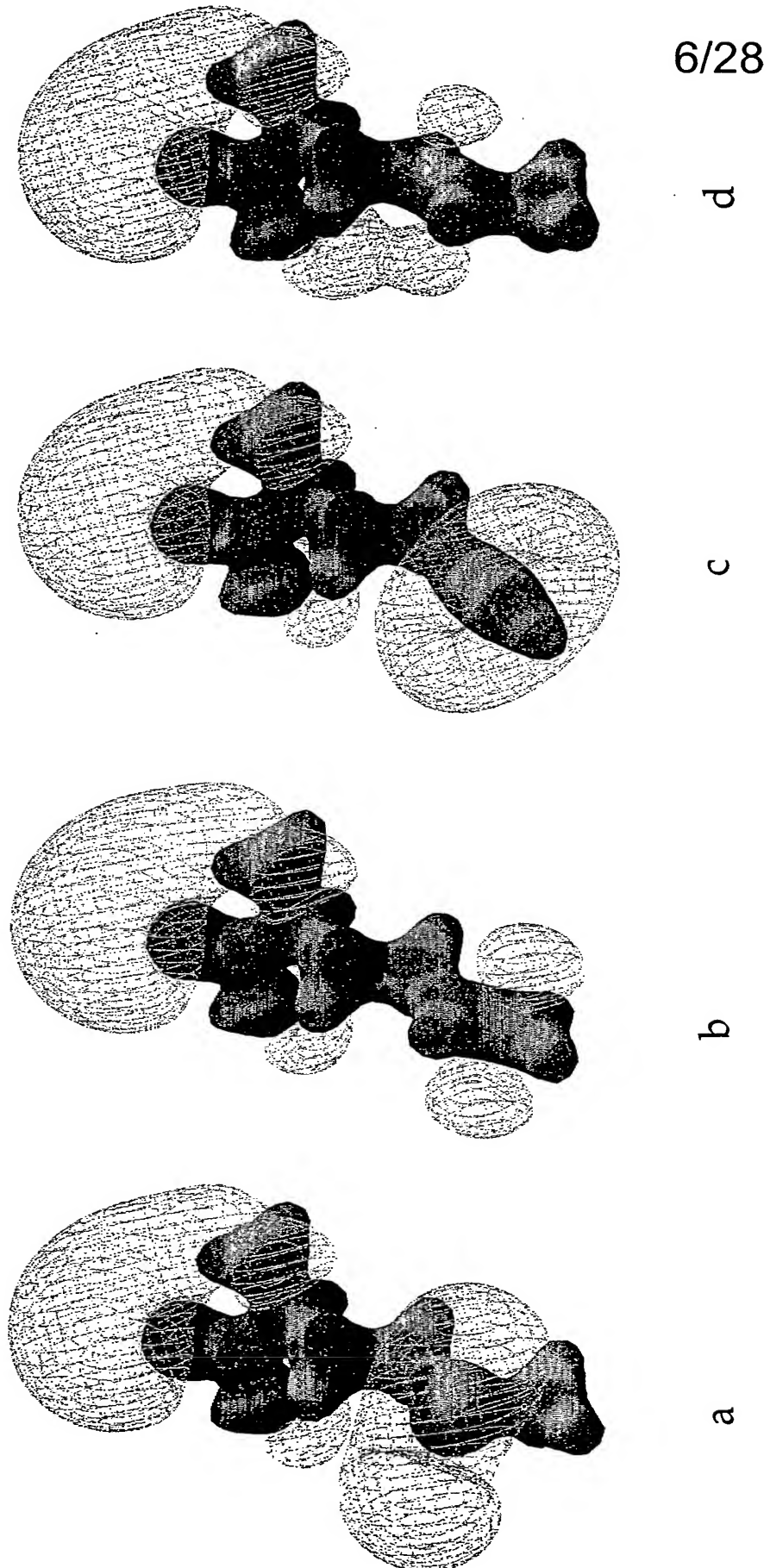
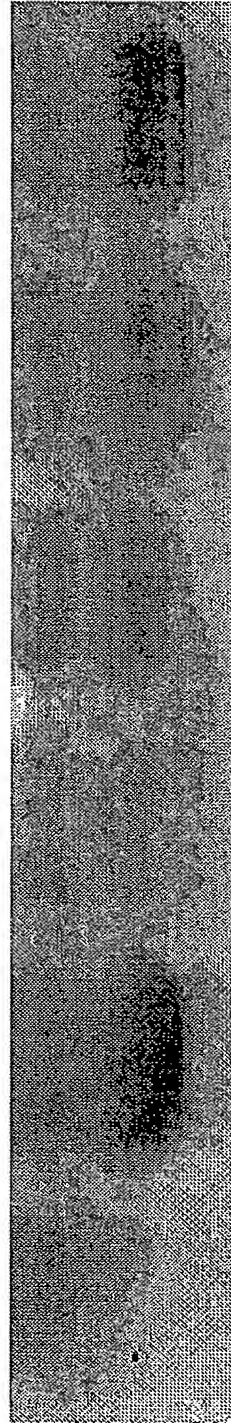


FIG. 6

7/28

pQE15 pQE15-MRS



- Met + Met +Tcg - Met + Met +Tcg

FIG. 7

8/28

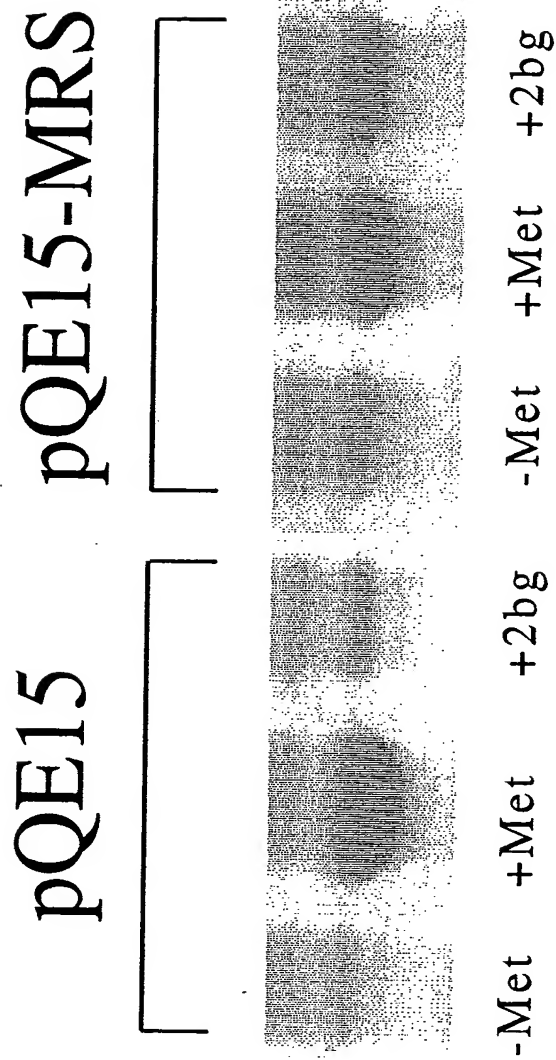
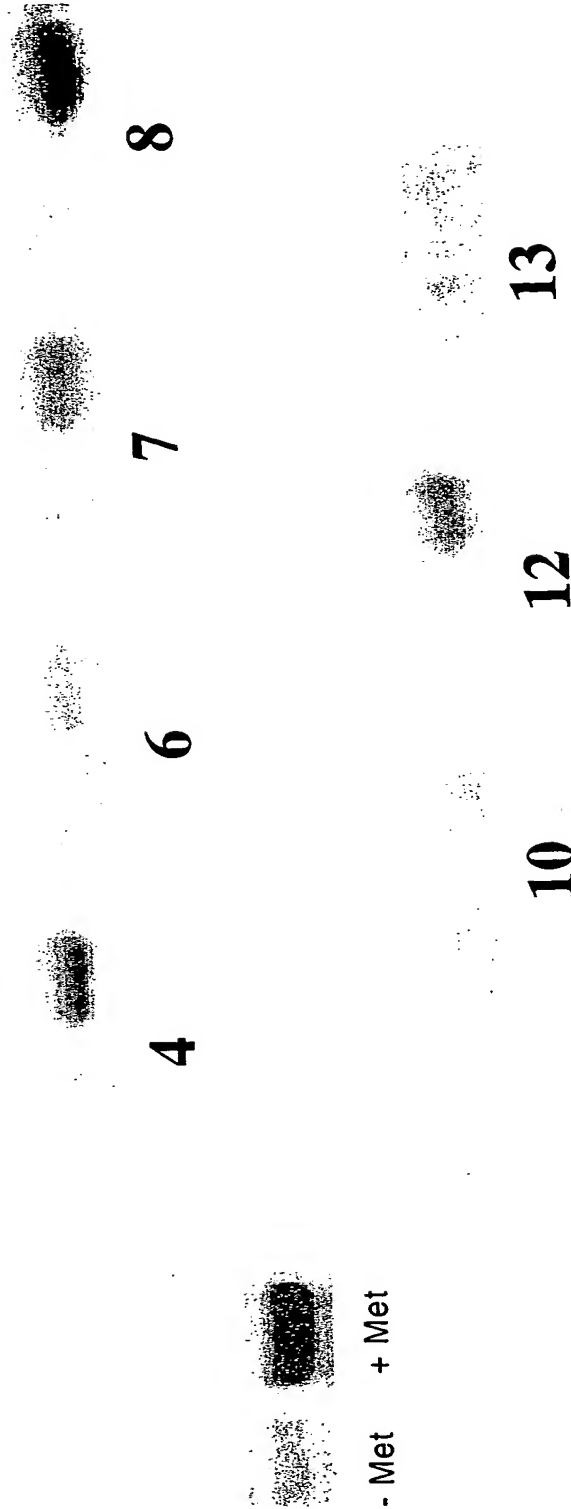


FIG. 8

9/28

pQE15 pQE15-MRS



- Met + Met

FIG. 9

10/28

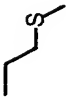


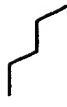






Analyte (Side chain shown)	k_{cat}/K_m ($s^{-1} \mu M^{-1}$)	Relative Value	Incorporated by conventional host?
Met 	5.47×10^{-1}	1	Y
Aha 	1.4×10^{-3}	1/390	Y
Hpg 	1.08×10^{-3}	1 / 500	Y
Norl 	5.22×10^{-4}	1 / 1050	Y
Hag 	2.96×10^{-4}	1 / 1850	Y
Tcg 	1.16×10^{-4}	1 / 4700	N
2bg 	3.9×10^{-5}	1/13825	N
Norv 	1.2×10^{-5}	1/46100	N
Ccg 	3.2×10^{-6}	1/171000	N
Ag 	1.2×10^{-6}	1/456000	N

FIG. 10

11/28

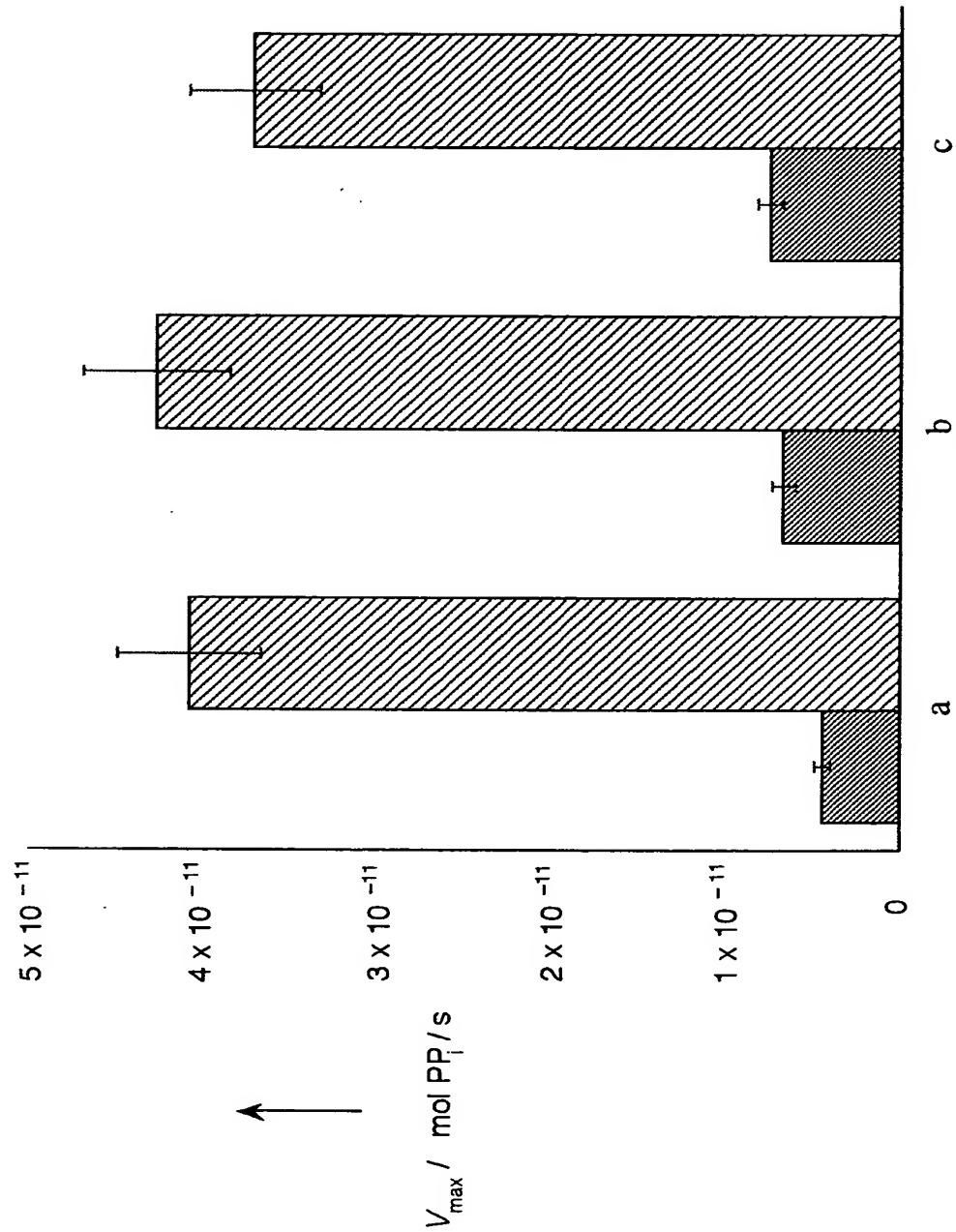


FIG. 11

12/28

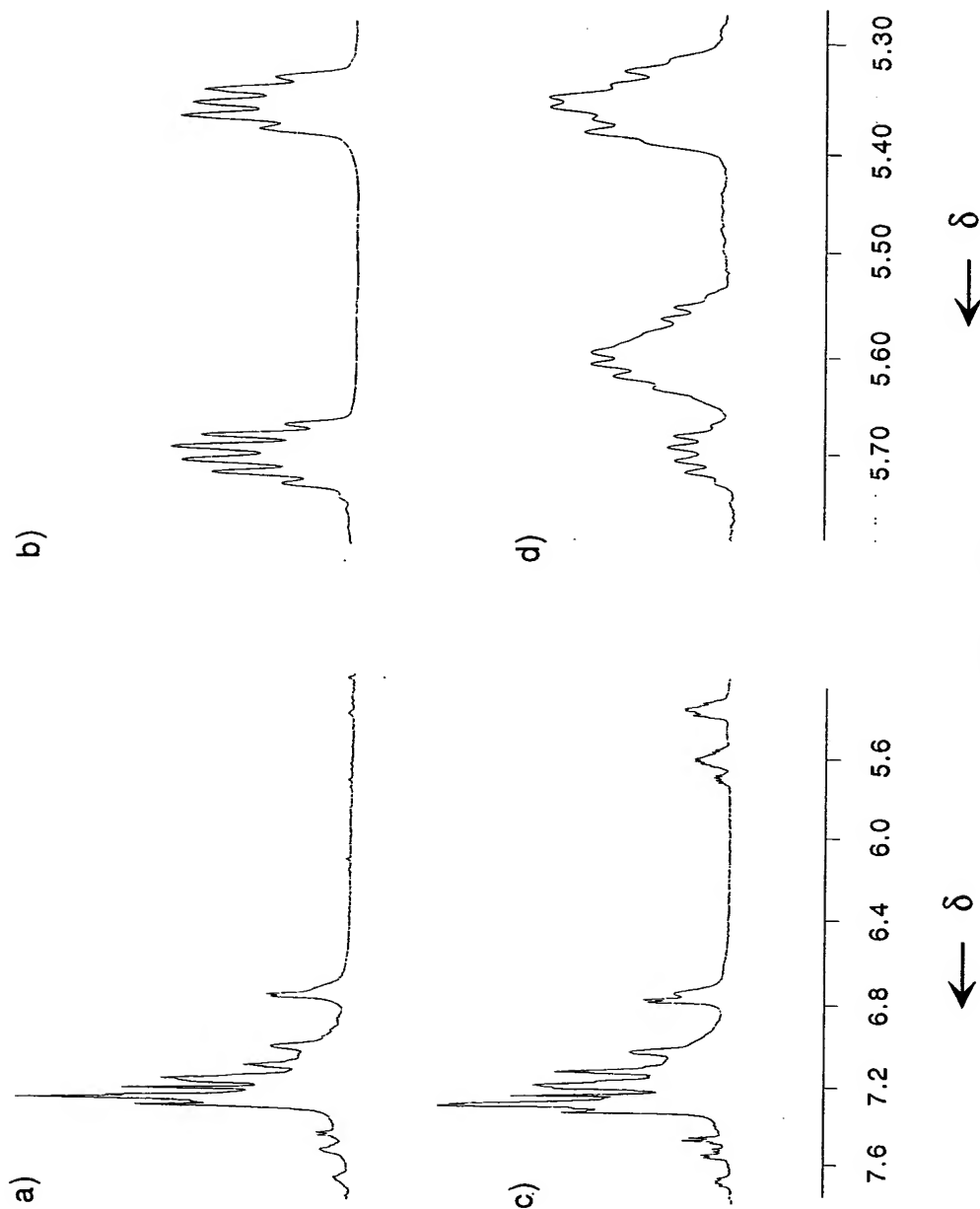


FIG. 12

13/28

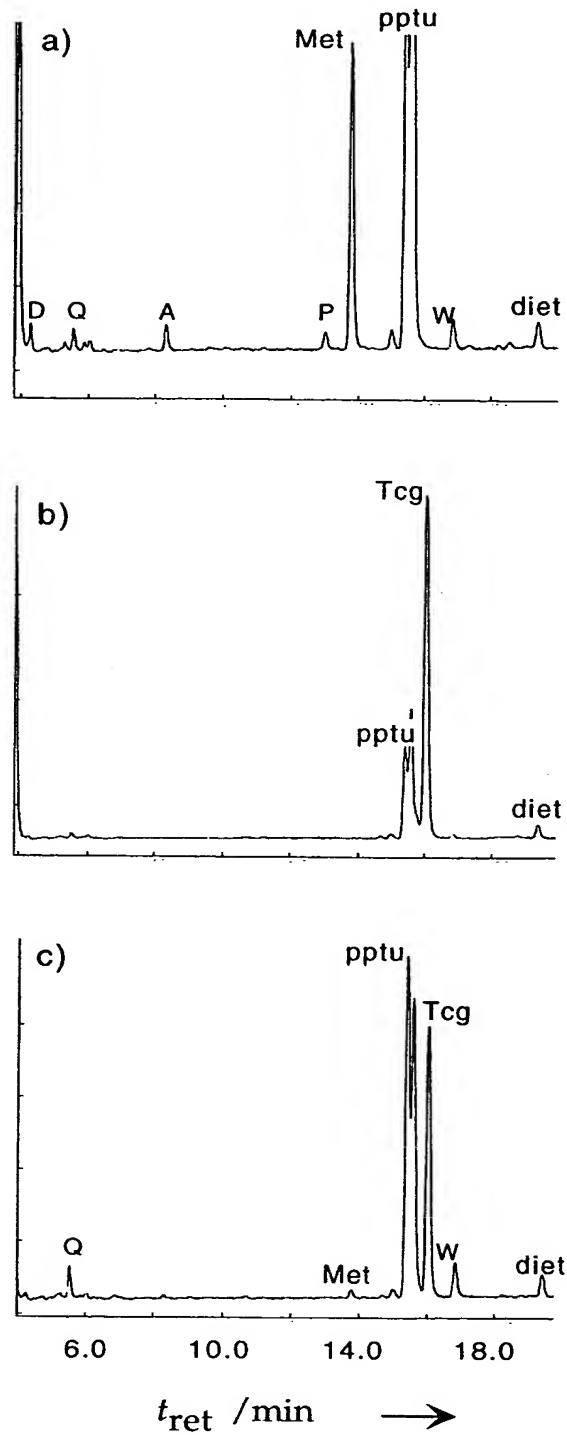


FIG. 13

14/28

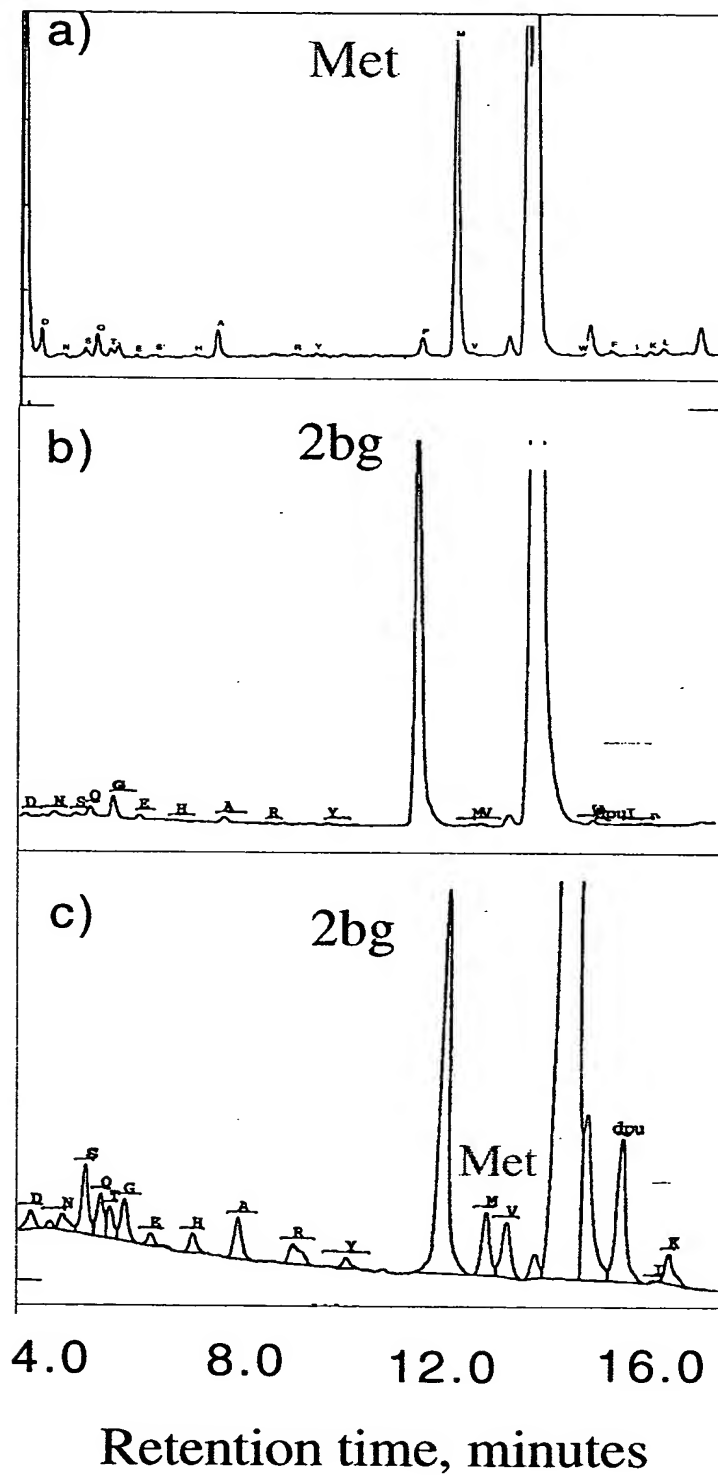


FIG. 14

15/28

Analogue	K_m (μM)	k_{cat} (s^{-1})	k_{cat}/K_m ($s^{-1}\mu M^{-1}$)	Protein Yield, mg/L
1	24.3 ± 2	13.3 ± 0.2	5.47×10^{-1}	35
3	2415 ± 170	2.60 ± 0.3	1.08×10^{-3}	35
9	4120 ± 900	2.15 ± 0.6	5.22×10^{-4}	20
2	4555 ± 200	1.35 ± 0.1	2.96×10^{-4}	10
5	$15,675 \pm 250$	1.82 ± 0.6	1.16×10^{-4}	0

FIG. 15

16/28

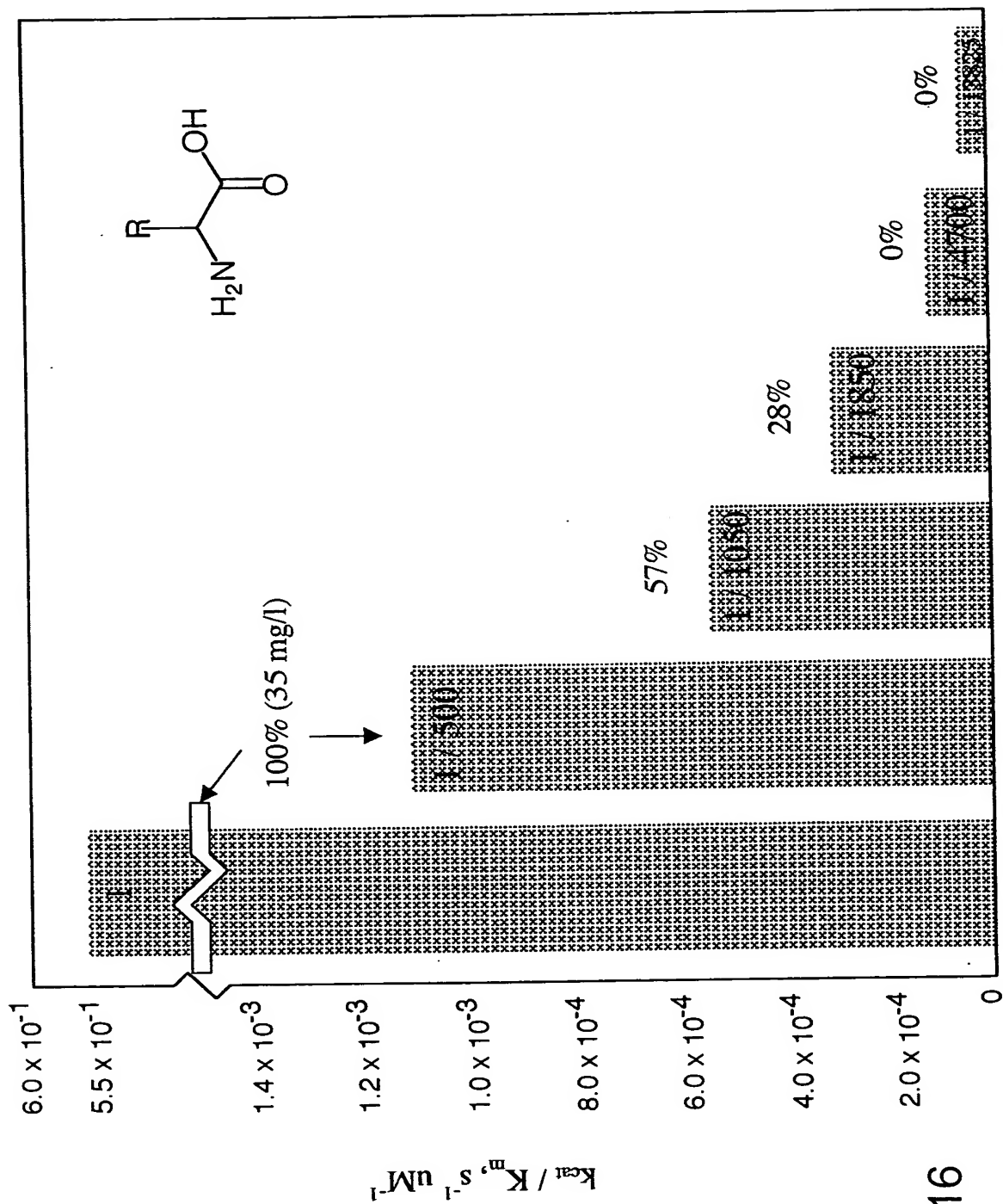


FIG. 16

17/28

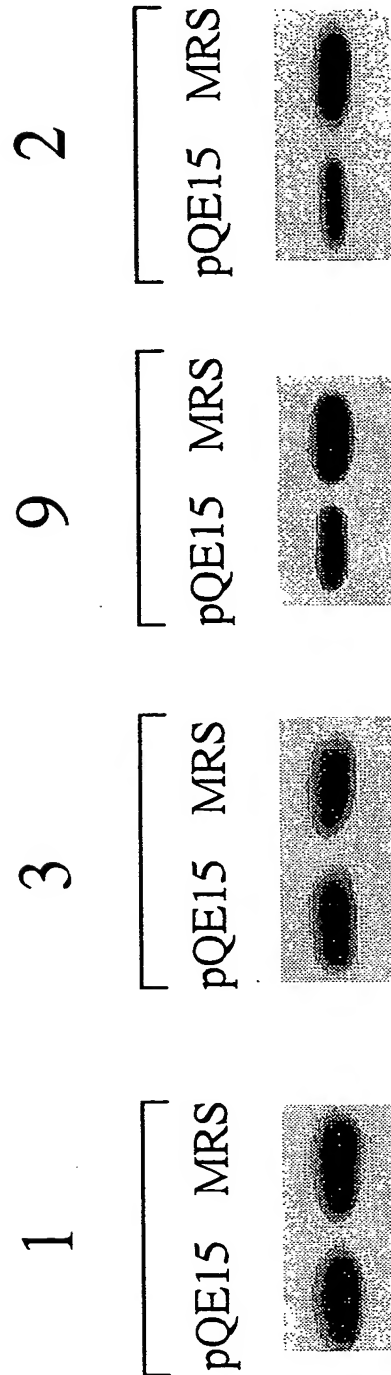


FIG. 17

18/28

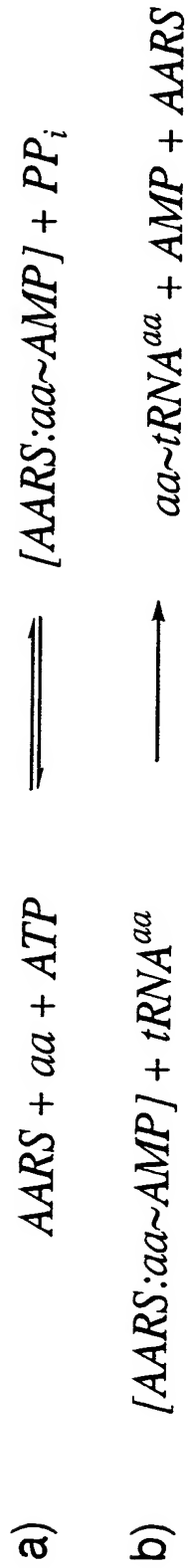


FIG. 18

19/28

CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTGAGCGGA TAACAAATTAT AATAGATTCA 60
ATTGTGAGCG GATAACAATT TCACACAGAA TTCATTAAAG AGGAGAAATT AACATGAGA 120
GGATCGCATC ACCATCACCA TCACGGATCC GGCATCATGG TTCGACCATT GAACTCGATC 180
GTCGCCGTGT CCCAAAATAT GGGGATTGGC AAGAACGGAG ACCTACCCCTG GCCTCCGCTC 240
AGGAACGAGT TCAAGTACTT CCAAAGAATG ACCACAACCT CTTCAGTGGA AGGTAAACAG 300
AATCTGGTGA TTATGGGTAG GAAAACCTGG TTCTCCATTG CTGAGAAGAA TCGACCTTTA 360
AAGGACAGAA TTAATATAGT TCTCAGTAGA GAACTCAAAG AACCAACACG AGGAGCTCAT 420
TTTTCTTGCCA AAAGTTTGA TGATGCCCTTA AGACTTATTG AACAAACCGA ATTGGCAAGT 480
AAAGTAGACA TGGTTTGAT AGTCGGAGGC AGTCTGTGTT ACCAGGAAGC CATGAATCAA 540
CCAGGCCACC TTAGACTCTT TGTGACAAGG ATCATGCAGG AATTGAAAG TGACACGTTT 600
TTCCCCAGAAA TTGATTGGG GAAATATAAA CTTCTCCCAG AATACCCAGG CGTCCCTCTCT 660
GAGGTCCAGG AGGAAAAAGG CATCAAGTAT AAGTTTGAAG TCTACGAGAA GAAAGTTGG 720
AAGATCTTAA GCTTAATTAG CTGAGCTTGG ACTCCTGTTG ATAGATCCAG TAATGACCTC 780
AGAACTCCAT CTGGATTGTG TCAGAAACGCT CGGTTGCCGC CGGGCGTTT TTATTGGTGA 840
GAATCCAAGC TAGCTCTAGA GACGTCGGGC CGGAGCTCCA CCGCGGTGGC GGCCGCTCTA 900
GAGTCACTTA CTTAACATTT TCCCATTTGG TACTATCTAA CCCCTTTTCA CTATTAAAGAA 960
GTAATGCCCTA CTATGACTCA AGTCGCGAAG AAAATTCTGG TGACGTGCGC ACTGCCGTAC 1020
GCTAACGGCT CAATCCACCT CGGCCATATG CTGGAGCACA TCCAGGCTGA TGTCTGGTC 1080
CGTTACCAGC GAATGCGCGG CCACGAGGTC AACTTCATCT GCGCCGACGA TGCCACCGGT 1140
ACACCCGATCA TGCTGAAAGC TCAGCAGCTT GGTATCACCC CGGAGCAGAT GATTGGCGAA 1200
ATGAGTCAGG AGCATCAGAC TGATTTTCGCA GGCTTTAACA TCAGCTATGA CAACTATCAC 1260
TCGACGCACA CGGAAGAGAA CCGCCAGTTG TCAGAACTTA TCTACTCTCG CCTGAAAGAA 1320
AACGGTTTTA TTAAAAACCG CACCATCTCT CAGCTGTACG ATCCGGAAAA AGGCATGTTT 1380
CTGCCGGACC GTTTTGTGAA AGGCACCTGC CCGAAATGTA AATCCCCGGA TCAATACGGC 1440
GATAAAGTGC AAGTCTGCGG GCGACCTTAC AGCCCGACTG AACTGATCGA GCCGAAATCG 1500
GTGGTTTCTG GCGCTACGCC GGTAATGCGT GATTCTGAAC ACTTCTTCTT TGATCTGCCC 1560

FIG. 19-1

20/28

TCTTTCAGCG AATGTTGCA GGCATGGACC CGCAGCGGTG CGTTGCAGGA GCAGGTGGCA 1620
AATAAAATGC AGGAGTGGTT TGAATCTGGC CTGCAACAGT GGGATATCTC CCGCGACGCC 1680
CCTTACTTCG GTTTTGAAAT TCCGAACGCG CCGGGCAAAT ATTTCTACGT CTGGCTGGAC 1740
GCACCGATTG GCTACATGGG TTCTTTCAAG AATCTGTGCG ACAAGCGCGG CGACAGCGTA 1800
AGCTTCGATG AATACTGGAA GAAAGACTCC ACCGCCGAGC TGTACCACTT CATCGGTAAA 1860
GATATTGTTT ACTTCCACAG CCTGTTCTGG CCTGCCATGC TGAAGGCAG CAACTTCCGC 1920
AAGCCGTCCA ACCTGTTTGT TCATGGCTAT GTGACGGTGA ACGGCGCAA GATGTCCAAG 1980
TCTCGCGGCA CCTTTATTAA AGCCAGCACC TGGCTGAATC ATTTTGACGC AGACAGCCTG 2040
CGTTACTACT ACACATGCGAA ACTCTCTTCG CGCATTGATG ATATCGATCT CAACCTGGAA 2100
GATTTCGTTT AGCGTGTGAA TGCCGATATC GTTAACAAAG TGGTTAACCT GGCCCTCCCGT 2160
AATGCGGGCT TTATCAACAA CGGTTTGTAC GGCGTGCTGG CAAGCGAACT GGCTGACCCG 2220
CAGTTGTACA AAACCTTCAC TGATGCCGCT GAAATGATTG GTGAAGCGTG GGAAGCCCGT 2280
GAATTGGTA AGCCGTGCG CGAAATCATG GCGCTGGCTG ATCTGGCTAA CCGCTATGTC 2340
GATGAACAGG CTCCGTGGT TGGGCATCAA CCTGTTCCGC CAGGAAGGCC GCGATGCCGA CCTGCAGGCA 2400
ATTTGCTCAA TGGGCATCAA CCTGTTCCGC GTGCTGATGA CTTACCTGAA GCCGGTACTG 2460
CCGAAACTGA CCGAGCGTGC AGAAGCATTC CTCAATACGG AACTGACCTG GGATGGTATC 2520
CAGCAACCCG TGCTGGGCCA CAAAGTGAAT CCGTTCAAGG CGCTGTATAA CCGCATCGAT 2580
ATGAGGCAGG TTGAAGCACT GGTGGAAGCC ATTCAGGAAA CCATCACCTT TGACGACTTC 2640
CCGGTAACTG GCCCGCTGGC AGATGATCCG GCGCTGATT GAAACGCAG AGTTTGTGA AGGTTCTGAC 2700
GCTAAAGTTG ACCTGCGCGT GGCTCTCGG GGTGAAAAAC GCAATGTCTT CTCGGGTATT 2760
AAACTGCTGC GCCTGACGCT GGATCTCGG GCAGGCACTG ATTGGTCGTC ACACCATAT ACACCATAT 2820
CGTTCTGCTT ACCCGGATCC GTTCCGATC TCTGAAGGCA TGGTGATGGC TGCCGGTCCCT 2880
CTGGCACCCAC GTAAAATGCG CTTCCGATC GATGCCGGTG CTAACCCGGG TCATCAGGTG 2940
GGCGGGAAG ATATTTTCTT GCTAAGCCCG GATGCCGGTG CTAACCCGGG TCATCAGGTG 3000
AAATAATCCC CCTTCAAGGC GCTGCATCGA CAGCCTTTTG CTTTATAAAT TCCTAAAGTT 3060
GTTTTCTTGC GATTTTGTCT CTCTCTAACC CGCATAAATA CTGGTAGCAT CTGCATTCAA 3120

FIG. 19-2

21/28

CTGGATAAAA TTACAGGGGAT GCAGAAATGAG ACACTTTATC TATCAGGACG AAAAATCACA 3180
TAAATTTCAGG GCAGTTGAGC AACAGGAAA CGAGTTGCAT ATCAGTTGGG GAAAAGTTGG 3240
CACCAAAGGC AAAGCCAGAT AAAAAGTTTT TCAGATGCTG CGGACGCTG CTTGGCGGAG 3300
CCCGACCTCG AGGGGGGGCC CGGTACCCGG CCGACGCTCT CTAGAGCTAG CTTGGCGAGA 3360
TTTTTCAGGAG CTAAGGAAGC TAAATGGAG AAAAAATCA CTGGATATAC CACCGTTGAT 3420
ATATCCCAAT GGCATCGTAA AGAACATTTT GAGGCATTTC AGTCAGTTGC TCAATGTACC 3480
TATAACCAGA CCGTTCAGCT GGATATTACG GCCTTTTAA AGACCGTAA GAAAAATAAG 3540
CACAAAGTTT ATCCGGCCCTT TATTCACATT CTTGCCCGCC TGATGAATGC TCATCCGGAA 3600
TTTCGTATGG CAATGAAAGA CCGTGAGCTG GTGATATGG ATAGTGTTCA CCGTTGTTAC 3660
ACCGTTTTCC ATGAGCAAAC TGAACGTTTT TCATCGCTCT GGAGTGAATA CCACGACGAT 3720
TTCCGGCAGT TTCTACACAT ATATTGCAA GATGTGGCGT GTTACGGTGA AAACCTGGCC 3780
TATTTCCCTA AAGGGTTTAT TGAGAAATATG TTTTTCGTCT CAGCCAATCC CTGGTGAGT 3840
TTCACCCAGT TTGATTTAAA CGTGCCCAAT ATGGACAACT TCTTCGCCCC CGTTTTCACC 3900
ATGGGCAAAAT ATTATACGCA AGCGACAAG GTGCTGATGC CGCTGGCGAT TCAGGTTTCA 3960
CATGCCGTCT GTGATGGCTT CCATGTCGGC AGAATGCTTA ATGAATTACA ACAGTACTGC 4020
GATGAGTGGC AGGCGGGGC GTAATTTTTT TAAGGCAGTT ATTGGTGCCC TTAACGCCT 4080
GGGGTAATGA CTCTCTAGCT TGAGGCATCA AATAAAACGA AAGGCTCAGT CGAAAGACTG 4140
GGCCTTTCGT TTTATCTGTT GTTTGTCGGT GAACGCTCTC CTGAGTAGGA CAAATCCGCC 4200
GCTCTAGAGC TGCCTCGCGC GTTTCGGTGA TGACGGTGAA AACCTCTGAC ACATGCAGCT 4260
CCCGGAGACG GTCACAGCTT GTCTGTAAGC GGATGCCGGG AGCAGACAAG CCCGTCAGGG 4320
CGCGTCAGCG GGTGTTGGCG GGTGTCGGGG CGCAGCCATG ACCCAGTCAC GTAGCGATAG 4380
CGGAGTGAT ACTGGCTTAA CTATGCGGCA TCAGAGCAGA TTGTACTGAG AGTGCACCAT 4440
ATGCGGTGTG AAATACCGCA CAGATGCGTA AGGAGAAAAT ACCGCATCAG GCGCTCTTCC 4500
GCTTCCTCGC TCACTGACTC GCTGCGCTCG GTCTGTCGGC TCGGGCGAGC GGTATCAGCT 4560
CACTCAAAGG CGGTAATACG GTTATCCACA GAATCAGGGG ATAACGCAGG AAAGAACATG 4620
TGAGCAAAAG GCCAGCAAAA GGCCAGGAAC CGTAAAAAGG CCGCGTTGCT GCGGTTTTTC 4680

FIG. 19-3

22/28

CATAGGCTCC GCCCCCCCTGA CGAGCATCAC AAAAATCGAC GCTCAAAGTCA GAGGTGGCGA 4740
AACCCGACAG GACTATAAAG ATACCAGGCG TTTCCCCCTG GAAGCTCCCT CGTGCGCTCT 4800
CCTGTTCCGA CCTGCGCGT TACCGGATAC CTGTCCGCTT TCTCCCTTC GGAAGCGTG 4860
GGCCTTTCTC AATGCTCACG CTGTAGGTAT CTCAGTTCGG TGTAGTCTG TCGCTCCAAG 4920
CTGGGCTGTG TGCACGAACC CCCCCTTCAG CCGACCGCT GCGCCTTATC CGTAACTAT 4980
CGTCTTGAGT CCAACCCGGT AAGACACGAC TTATCGCCAC TGGCAGCAG CACTGGTAAC 5040
AGGATTAGCA GAGCGAGGTA TGTAGGCGGT GCTACAGAGT TCTGAAGTG GTGGCCTAAC 5100
TACGGCTACA CTAGAAGGAC AGTATTGGT ATCTGCGCTC TGCTGAAGCC AGTTACCTTC 5160
GGAAAAAGAG TTGGTAGCTC TTGATCCGGC AAACAAACCA CCGCTGGTAG CCGTGGTTT 5220
TTTGTTTGCA AGCAGCAGAT TACGCGCAGA AAAAAGGAT CTCAAAGAAGA TCCTTTGATC 5280
TTTTCTACGG GGTCTGACGC TCAGTGGAAC GAAAACCTAC GTTAAAGGAT TTTGGTCATG 5340
AGATTATCAA AAAGGATCTT CACCTAGATC CTTTAAATT AAAAATGAAG TTTTAAATCA 5400
ATCTAAAGTA TATATGAGTA AACTTGGTCT GACAGTTACC AATGCTTAAT CAGTGAGGCA 5460
CCTATCTCAG CGATCTGTCT ATTCGTTC TAATAGCTG TCCATAGCTG CCTGACTCCC CGTCGTGTAG 5520
ATAACTACGA TACGGGAGGG CTTACCATCT GGGCCAGTG CTGCAATGAT ACCGCGAGAC 5580
CCACGCTCAC CGGCTCCAGA TTTATCAGCA ATAAACCAGC CAGCCGGAAG GGCCGAGCGC 5640
AGAAGTGGTC CTGCAACTTT ATCCGCCCTCC ATCCAGTCTA TTAATTGTTG CCGGGAAGCT 5700
AGAGTAAGTA GTTCGCCAGT TAATAGTTG CGCAACGTTG TGCCCATTCG TACAGGCATC 5760
GTGGTGTAC GCTCGTCGTT TGGTATGGCT TCATTCAGCT CCGGTTCCCA ACGATCAAGG 5820
CGAGTTACAT GATCCCCCAT GTTGTCAAA AAAGCGGTTA GCTCCTTCGG TCCTCCGATC 5880
GTTGTCAGAA GTAAGTTGGC CGCAGTGTTA TCACTCATGG TTATGGCAGC ACTGCATAAT 5940
TCTCTTACTG TCATGCCATC CGTAAGATGC TTTTCTGTGA CTGGTGAGTA CTCAACCAAG 6000
TCATTCTGAG AATAGTGAT GCGCGACCG AGTTGCTCTT GCCCGCGCTC AATACGGGAT 6060
AATACCGCGC CACATAGCAG AACTTTAAAA GTGCTCATCA TTGGAAAAACG TTCTTCGGG 6120
CGAAAACTCT CAAGGATCTT ACCGCTGTTG AGATCCAGTT CGATGTAACC CACTCGTGCA 6180
CCCAACTGAT CTTCAGCATC TTTTACTTTC ACCAGCGTTT CTGGGTGAGC AAAAACAGGA 6240

FIG. 19-4

23/28

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AGGCAAAATG CCGCAAAAAA GGGAATAAGG GCGACACGGA AATGTTGAAT ACTCATACTC 6300
TTCCTTTTTC AATATTATTG AAGCATTTAT CAGGGTTATT GTCTCATGAG CGGATACATA 6360
TTTGAATGTA TTTAGAAAAA TAAACAAATA GGGTTCCGC GCACATTTCC CCGAAAAGTG 6420
CCACCTGACG TCTAAGAAAC CATTATTATC ATGACATTAA CCTATAAAAA TAGGCGTATC 6480
ACGAGGCCCT TTCGTCTTCA C                                     6501
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FIG. 19-5

24/28

CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTAGCGGA TAACAATTAT AATAGATTCA 60
ATTGTAGCG GATAACAATT TCACACAGAA TTCATTAAAG AGGAGAAATT AACTATGAGA 120
GGATCGCATC ACCATCACCA TCACGGATCC GGCATCATGG TTCGACCATT GAACTCGATC 180
GTCGCCGTGT CCAAAATAT GGGGATTGGC AAGAACGGAG ACCTACCCCTG GCCTCCGCTC 240
AGGAAACGAGT TCAAGTACTT CCAAAGAATG ACCACAACCT CTTCAGTGGA AGGTAAACAG 300
AATCTGGTGA TTATGGGTAG GAAAACCTGG TTCTCCATTC CTGAGAAGAA TCGACCTTTA 360
AAGGACAGAA TTAATATAGT TCTCAGTAGA GAACTCAAAG AACCAACCAG AGGAGCTCAT 420
TTTCTTGCCA AAAGTTTGA TGATGCCCTTA AGACTTATTG AACAAACCGGA ATTGGCAAGT 480
AAAGTAGACA TGGTTTGGAT AGTCGGAGGC AGTCTGTGT ACCAGGAAGC CATGAATCAA 540
CCAGGCCACC TTAGACTCTT TGTGACAAGG ATCATGCAGG AATTTGAAAG TGACACGTTT 600
TTCCCCAGAA TTGATTTGGG GAAATATAAA CTTCTCCCAG AATACCCAGG CGTCCCTCTCT 660
GAGGTCCAGG AGGAAAAAGG CATCAAGTAT AAGTTTGAAG TCTACGAGAA GAAAGTTGG 720
AAGATCTTAA GCTTAATTAG CTGAGCTTGG ACTCCTGTG ATAGATCCAG TAATGACCTC 780
AGAACTCCAT CTGGATTGTG TCAGAACGCT CGGTGCGCG CCGGCGTTT TTATTGGTGA 840
GAATCCAAGC TAGCTCTAGA GACGTCCGGC CGGAGCTCCA CCGCGGTGCG GCGCGCTCTA 900
GAGTCACTTA CTTAACATTT TCCCATTTGG TACTATCTAA CCCCTTTTCA CTATTAAAGAA 960
GTAATGCCCTA CTATGACTCA AGTCGCGAAG AAAATTCTGG TGACGTGCGC ACTGCCGTAC 1020
GCTAACGGCT CAATCCACCT CGGCCATATG CTGGAGCACA TCCAGGCTGA TGTCTGGGTC 1080
CGTTACCAGC GAATGCGCGG CCACGAGGTC AACTTCATCT GCGCCGACGA TGCCCAACGGT 1140
ACACCGATCA TGCTGAAAGC TCAGCAGCTT GGTATCACCC CGGAGCAGAT GATTGGCGAA 1200
ATGAGTCAGG AGCATCAGAC TGATTTTCGCA GGCTTTAACA TCAGCTATGA CAACTATCAC 1260
TCGACGCACA CGGAAGAGAA CCGCCAGTTG TCAGAACTTA TCTACTCTCG CCTGAAAGAA 1320
AACGGTTTTA TTAAAAACCG CACCATCTCT CAGCTGTACG ATCCGGAAAA AGGCATGTTT 1380
CTGCCGGACC GTTTTGTGAA AGGCACCTGC CCGAAATGTA AATCCCCGGA TCAATACGGC 1440
GATAAAGTGG AAGTCTGCGG GCGACCTTAC AGCCCGACTG AACTGATCGA GCCGAAATCG 1500
GTGGTTTCTG GCGCTACGCC GGTAATGCGT GATTCTGAAC ACTTCTTCTT TGATCTGCCC 1560

FIG. 20-1

25/28

TCTTTCAGCG AATGTTGCA GGCATGGACC CGCATGCGGTG CGTTGCAGGA GCAGGTGGCA 1620
 AATAAAATGC AGGAGTGGTT TGAATCTGGC CTGCAACAGT GGGATATCTC CCGGACGCC 1680
 CCTTACTTCG GTTTTGAAT TCCGAACGCG CCGGGCAAAT ATTTCTACGT CTGGCTGGAC 1740
 GCACCGATTG GCTACATGGG TTCTTTCAAG AATCTGTGCG ACAAGCGCGG CGACAGCGTA 1800
 AGCTTCGATG AATACTGGAA GAAAGACTCC ACCGCCGAGC TGTACCACTT CATCGGTAAA 1860
 GATATTGTTT ACTTCCACAG CCGTGTCTTC CCTGCCATGC TGAAGGCAG CAACTTCCGC 1920
 AAGCCGTCCA ACCTGTTTGT TCATGGCTAT GTGACGGTGA ACGGCGCAA GATGTCCAAG 1980
 TCTCGCGGCA CCTTTATTAA AGCCAGCACC TGGCTGAATC ATTTTGACGC AGACAGCCTG 2040
 CGTTACTACT ACACTGCGAA ACTCTCTTCG CGCATTGATG ATATCGATCT CAACCTGGAA 2100
 GATTTCGTTT AGCGTGTGAA TGCCGATATC GTTAACAAAG TGGTTAACCT GGCCTCCCGT 2160
 AATGCGGGCT TTATCAACAA GCGTTTGTAC GGCCTGCTGG CAAGCGAACT GGCTGACCCG 2220
 CAGTTGTACA AAACCTTTCAC TGATGCCGCT GAAAGTATTG GTGAAGCGTG GAAAAGCCGT 2280
 GAATTTGGTA AAGCCGTGCG CGAAATCATG GCGCTGGCTG ATCTGGCTAA CCGCTATGTC 2340
 GATGAACAGG CTCCGTGGGT GGTGGCGAAA CAGGAAGGCC GCGATGCCGA CCTGCAGGCA 2400
 ATTTGCTCAA TGGGCATCAA CCTGTTCCGC GTGCTGATGA CTTACCTGAA GCCGGTACTG 2460
 CCGAAACTGA CCGAGCGTGC AGAAGCATTC CTTCAATACGG AACTGACCTG GGATGGTATC 2520
 CAGCAACCCG TGCTGGGCCA CAAAGTGAAT CCGTTCAAGG CGCTGTATAA CCGCATCGAT 2580
 ATGAGGCAGG TTGAAGCACT GGTGGAAGCC TCTAAATGAG AAGTAAAAGC CGCTGCCGCG 2640
 CCGGTAAC TG CCGCTGGC AGATGATCCG ATTCAGGAAA CCATCACCTT TGACGACTTC 2700
 GCTAAAGTTG ACCTGCGCGT GCGCTGATT GAAAACGCAG AGTTTGTGA AGGTTCTGAC 2760
 AACTGCTGC GCCTGACGCT GGATCTCGGC GTGAAAAAC GCAATGTCTT CTCCGGTATT 2820
 CGTTCTGCTT ACCCGGATCC GCAGGCACTG ATTGGTCGTC ACACCATTAAT GGTGGCTAAC 2880
 CTGGCACCCAC GTAAAAATGCG CTTCCGGTATC TCTGAAGGCA TGGTGATGGC TGCCGGTCCCT 2940
 GCGGGGAAAG ATATTTTCCT GCTAAGCCCG GATGCCGGTG CTAACCCGGG TCATCAGGTG 3000
 AAATAATCCC CCTTCAAGGC GCTGCATCGA CAGCCTTTTG CTTTATAAAT TCCTAAAGTT 3060
 GTTTTCTTGC GATTTTGTCT CTCCTTAACC CGCATAAATA CTGGTAGCAT CTGCATTCAA 3120

FIG. 20-2

26/28

CTGGATAAAA TTACAGGGAT GCAGAAATGAG ACACTTTATC TATCAGGACG AAAAAATCACA 3180
TAAATTACAG GCAGTTGAGC AACAGGAAA CGAGTTGCAT ATCAGTTGGG GAAAAGTTGG 3240
CACCAAAGGC AAAGCCAGAT AAAAAGTTTT TCAGATGCTG CGGCAGCGGC AAAAGCGGAG 3300
CCCGACCTCG AGGGGGGGCC CGGTACCCGG CCGGACGTCT CTAGAGCTAG CTTGGCGAGA 3360
TTTTTCAGGAG CTAAGGAAGC TAAAAATGGAG AAAAAAATCA CTGGATATAC CACCGTTGAT 3420
ATATCCCAAT GGCATCGTAA AGAACATTTT GAGGCATTTT AGTCAGTTGC TCAATGTACC 3480
TATAACCAGA CCGTTCAGCT GGATATTACG GCCTTTTAA AGACCGTAAA GAAAAATAAG 3540
CACAAAGTTT ATCCGGCCTT TATTACACAT CTTGCCCGCC TGATGAATGC TCATCCGGAA 3600
TTTCGTATGG CAATGAAAGA CCGTGAGCTG GTGATATGG ATAGTGTTCA CCCTTGTTAC 3660
ACCGTTTTCC ATGAGCAAAC TGAAACGTTT TCATCGCTCT GGAGTGAATA CCACGACGAT 3720
TTCCGGCAGT TTCTACACAT ATATTGCAA GATGTGGCGT GTTACGGTGA AAACCTGGCC 3780
TATTTCCCTA AAGGGTTTAT TGAGAAATATG TTTTTCGTCT CAGCCAAATC CTGGGTGAGT 3840
TTCACCAAGT TTGATTTAAA CGTGCCCAAT ATGGACAACT TCTTCGCCCC CGTTTTCACC 3900
ATGGGCAAAAT ATTATACGCA AGCGACAAAG GTGCTGATGC CGCTGGCGAT TCAGGTTTCAT 3960
CATGCCGTCT GTGATGGCTT CCATGTCGGC AGAATGCTTA ATGAATTACA ACAGTACTGC 4020
GATGAGTGGC AGGCGGGGGC GTAATTTTTT TAAGGCAGTT ATTGGTGCCC TTAACGCCT 4080
GGGGTAATGA CTCTCTAGCT TGAGGCATCA AATAAAACGA AAGGCTCAGT CGAAAGACTG 4140
GGCCTTTTCGT TTTATCTGTT GTTTGTCGGT GAACGCTCTC CTGAGTAGGA CAAATCCGCC 4200
GCTCTAGAGC TGCCTCGCGC GTTTCGGTGA TGACGGTGAA AACCTCTGAC ACATGCAGCT 4260
CCCGGAGACG GTCACAGCTT GTCGTAAAGC GGATGCCGGG AGCAGACAAG CCCGTCAGGG 4320
CGCGTCAGCG GGTGTTGGCG GGTGTCGGGG CGCAGCCATG ACCCAGTCAC GTAGCGATAG 4380
CGGAGTGTAT ACTGGCTTAA CTATGCGGCA TCAGAGCAGA TTGTACTGAG AGTGCAACCAT 4440
ATGCGGTGTG AAATACCGCA CAGATGCCGA AGGAGAAAAT ACCGCATCAG GCGCTCTTCC 4500
GCTTCCTCGC TCACTGACTC GCTGCGCTCG GTCTGTCGGC TCGGCGGAGC GGTATCAGCT 4560
CACTCAAAGG CGGTAATACG GTTATCCACA GAATCAGGGG ATAACGCAGG AAAGAACATG 4620
TGAGCAAAAG GCCAGCAAAA GGCCAGGAAC CGTAAAAAGG CCGCGTTGCT GCGGTTTTTC 4680

FIG. 20-3

27/28

CATAGGCTCC GCCCCCCTGA CGAGCATCAC AAAAATCGAC GCTCAAGTCA GAGGTGGCGA 4740
 AACCCGACAG GACTATAAAG ATACCAGGCG TTTCCCCCTG GAAGCTCCCT CGTGCGCTCT 4800
 CCTGTTCCGA CCTGCGCGCT TACCGGATAC CTGTCCGCCT TTCTCCCTTC GGAAGCGTG 4860
 GCGCTTTCTC AATGCTCACG CTGTAGGTAT CTCAGTTCCG TGTAGGTCGT TCGCTCCAAG 4920
 CTGGCGTGTG TGCACGAACC CCCCGTTCAG CCGACCCGCT GCGCCTTATC CGTAACATAT 4980
 CGTCTTGAGT CCAACCCGGT AAGACACGAC TTATCGCCAC TGGCAGCAGC CACTGGTAAC 5040
 AGGATTAGCA GAGCGAGGTA TGTAGGCGGT GCTACAGAGT TCTTGAAGTG GTGGCCTAAC 5100
 TACGGCTACA CTAGAAGGAC AGTATTTGGT ATCTGCGCTC TGCTGAAGCC AGTTACCTTC 5160
 GGAAAAGAG TTGGTAGCTC TTGATCCGGC AAACAAACCA CCGCTGGTAG CCGTGGTTTT 5220
 TTTGTTTGCA AGCAGCAGAT TACGCGCAGA AAAAAGGAT CTCAAGAAAG TCCTTTGATC 5280
 TTTTCTACGG GGTCTGACGC TCAGTGGAAC GAAAACCTCAC GTTAAGGGAT TTTGGTCATG 5340
 AGATTATCAA AAAGGATCTT CACCTAGATC CTTTAAATT AAAAATGAAG TTTTAAATCA 5400
 ATCTAAAGTA TATATGAGTA AACTTGGTCT GACAGTTACC AATGCTTAAT CAGTGAGGCA 5460
 CCTATCTCAG CGATCTGTCT ATTTCGTTCA TCCATAGCTG CCTGACTCCC CGTCGTGTAG 5520
 ATAACTACGA TACGGGAGGG CTTACCATCT GGCCCCAGTG CTGCAATGAT ACCGCGAGAC 5580
 CCACGCTCAC CGGCTCCAGA TTTATCAGCA ATAAACCCAGC CAGCCGGAAG GGCCGAGCGC 5640
 AGAAGTGGTC CTGCAACTTT ATCCGCCCTCC ATCCAGTCTA TTAATTGTTG CCGGGAAGCT 5700
 AGAGTAAGTA GTTCGCCAGT TAATAGTTTG CGCAACGTTG TTGCCATTGC TACAGGCATC 5760
 GTGGTGTAC GCTCGTCGTT TGGTATGGCT TCATTCAGCT CCGGTTCCCA ACGATCAAGG 5820
 CGAGTTACAT GATCCCCCAT GTTGTGCAAA AAAGCGGTTA GCTCCTTCGG TCCTCCGATC 5880
 GTTGTGAGAA GTAAGTTGGC CGCAGTGTTA TCACTCATGG TTATGGCAGC ACTGCATAAT 5940
 TCTCTTACTG TCATGCCATC CGTAAGATGC TTTTCTGTGA CTGGTGAGTA CTCAACCAAG 6000
 TCATTCTGAG AATAGTGAT GCGCGGACCG AGTTGCTCTT GCCCGCGCTC AATACGGGAT 6060
 AATACCGCGC CACATAGCAG AACTTTAAAA GTGCTCATCA TTGGAAAAACG TTCTTCGGGG 6120
 CGAAAACCTCT CAAGGATCTT ACCGCTGTTG AGATCCAGTT CGATGTAACC CACTCGTGCA 6180
 CCCAACTGAT CTTCAGCATC TTTTACTTTC ACCAGCGTTT CTGGGTGAGC AAAAACAGGA 6240

FIG. 20-4

28/28

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AGGCAAAATG CCGCAAAAAA GGGAATAAGG GCGACACGGA AATGTTGAAT ACTCATACTC 6300
TTCCCTTTTC AATATTATTG AAGCATTTAT CAGGGTTATT GTCTCATGAG CCGATACATA 6360
TTTGAATGTA TTTAGAAAAA TAAACAAATA GGGGTTCCGC GCACATTTC CCGAAAAGTG 6420
CCACCTGACG TCTAAGAAAC CATTATTATC ATGACATTAA CCTATAAAAA TAGGCGTATC 6480
ACGAGGCCCT TTCGTCCTCA C 6501
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FIG. 20-5